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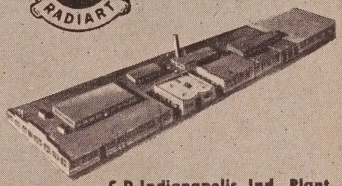

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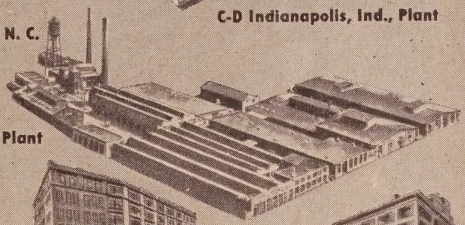

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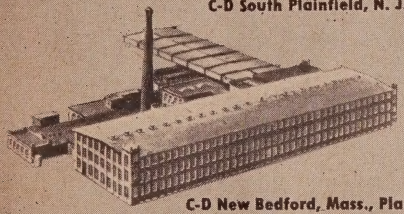

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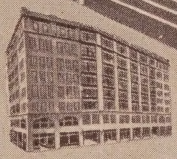

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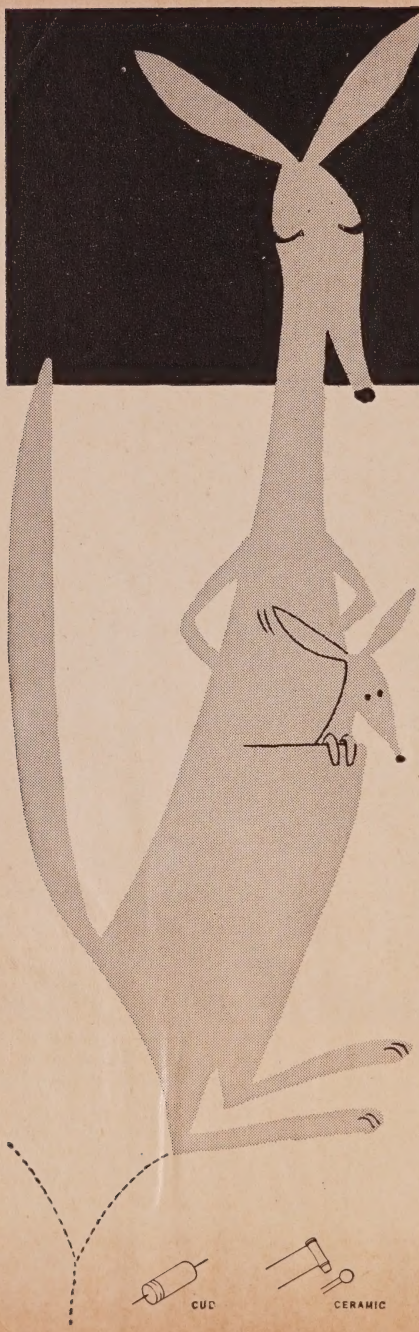

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SERVICING TV DEFLECTION SYSTEMS

Sawtooth *voltage* waves produce a linear sweep in a purely electrostatic deflection system, such as the horizontal circuit of an oscilloscope. But sawtooth *current* waves are required in a magnetic deflection system such as the horizontal and vertical deflection circuits of a TV receiver.

The current requirement of the electromagnetic system thus introduces problems not inherent in the electrostatic system. The first important consideration, for example, concerns the waveform of the deflection voltage. Specifically, a sawtooth voltage, which is generated rather easily, will not produce the required sawtooth current in the magnetic deflection circuit. We shall see why this is true.

The deflecting coils have inductance (L) as well as internal series resistance (R). Hence, the elementary relationship $E = IR$ from Ohm's Law will not apply. Instead, when L is large with respect to R, the voltage $E = L(dI/dt)$. When R is large so that L is significant but does not dominate the circuit, $E = IR + L(dI/dt)$. These equations say that the voltage across the coil equals, in the first case, the product of the coil inductance and the *change* in current with respect to the change in time (say, milliamperes per second); and in the second case is equal to this product *plus* the product of alternating current and coil resistance.

These facts reveal that the applied deflection voltage E must have a special waveform dictated by both the R and L loading effects of the coils, in order to force linear sawteeth of current through a deflection coil. They mean also that the shape of this voltage wave must admit of some of the requirements imposed by a strictly resistive load and some of those imposed by a strictly inductive load. This point will be clarified by an examination of Figure 1. If the coil currents are not sawtooth in waveform, the horizontal and vertical deflections of the cathode ray beam will not be linear and the picture will be

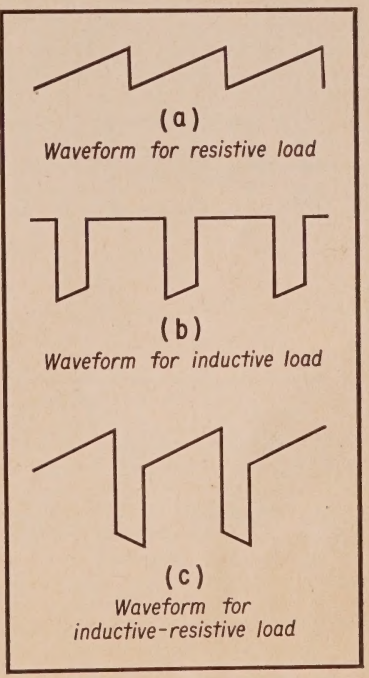

Fig. 1. Sweep-Voltage Waveforms.

reproduced unevenly up and down or across the screen.

Figure 1 shows the idealized waveform of sweep voltages which will force linear sawteeth of current through three different kinds of circuits. The sawtooth waveform in Figure 1(A) will produce corresponding sawtooth

clarification may be obtained by applying the equations to the Figures: $E = IR$ in Figure 1(A); $E = L(dI/dt)$ in Figure 1(B); and $E = IR + L(dI/dt)$ in Figure 1(C).

Though idealized in the drawings, these are the general shapes of the voltages to be expected across the

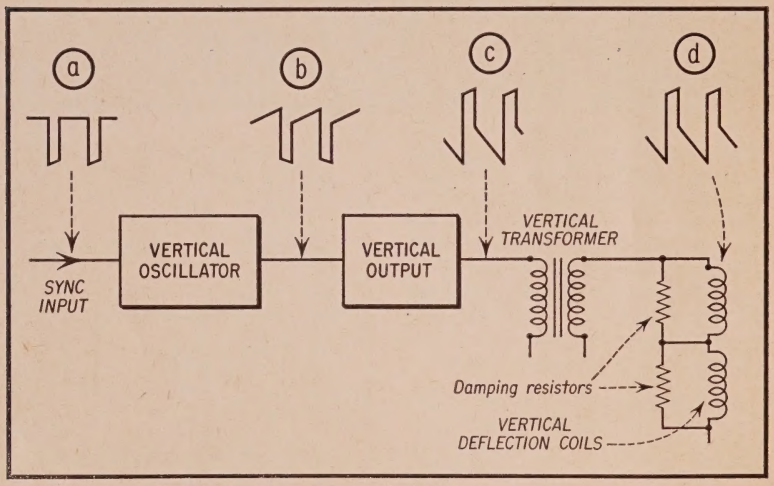

Fig. 2. Illustrative Vertical Deflection System.

current through a pure resistance. In order to produce sawtooth current in an ideal inductance which we imagine to have no resistance at all, the impulse type of voltage wave shown in Figure 1(B) is required. Note that this wave has long flat tops. Back e. m. f. set up by the inductance prevents the current from reaching instantaneously, amplitudes corresponding to the voltage values. Instead, the current rises more slowly to its maximum, describing a sawtooth. In practical deflection coils, both R and L are significant in magnitude, and the sweep voltage waveform must be a composite of Figures 1(A) and 1(B). The resultant wave is the shape shown in Figure 1(C). Further

deflection coils during correct operation. Their peak-to-peak amplitudes, widths and linearity govern the deflection efficiency. The deflection voltages are generated by the horizontal and vertical oscillators and their output circuits. The oscillators are triggered by the sync system. Hence, servicing of deflection systems often involves inspection and servicing of the horizontal and vertical sweep circuits as well as the deflection coils and their immediately adjacent circuitry.

Deflection Checking Procedure

Servicing of the deflection system begins with an examination of what

appears on the screen of the picture tube.

The extreme case is total deflection failure. In complete loss of vertical deflection, but with horizontal deflection intact, the pattern collapses to a single horizontal line traced across the screen, usually with noticeable brightness. Complete loss of horizontal deflection, with vertical deflection intact, is characterized by a single vertical line trace on the screen. Insufficient vertical amplitude results in top-to-bottom shortening of the raster; low horizontal amplitude causes side-to-side shortening.

Sweep non-linearity causes one or more sections of the picture to be stretched, squeezed, or crowded. When extreme, or nearly so, this condition is detected easily as stretching, compression, or foldover of the picture or test pattern. In an active, moving picture, a moving object is seen to grow fat or thin while passing through certain parts of the screen. Severe crowding, often evidenced at the ends or center of the screen, sometimes is revealed by a bright line or bar traversing the entire length of the screen. Crowding is caused by a slowing down of the sweep; stretching by a speeding up. In crowding, the sawtooth current wave increases at a rate somewhat less than linearity; in stretching, somewhat greater than linearity.

When non-linearity cannot be localized easily in a moving picture, and no test pattern is available, a cross-hatch generator should be used. Figure 4 shows typical cross-hatch patterns resulting from (a) a good horizontal sawtooth current waveform, and (b), (c), and (d) from non-linear horizontal deflections. In each instance, the vertical deflection is linear and therefore produces the evenly-spaced horizontal lines. Vertical non-linearity would be evidenced by crowding be-

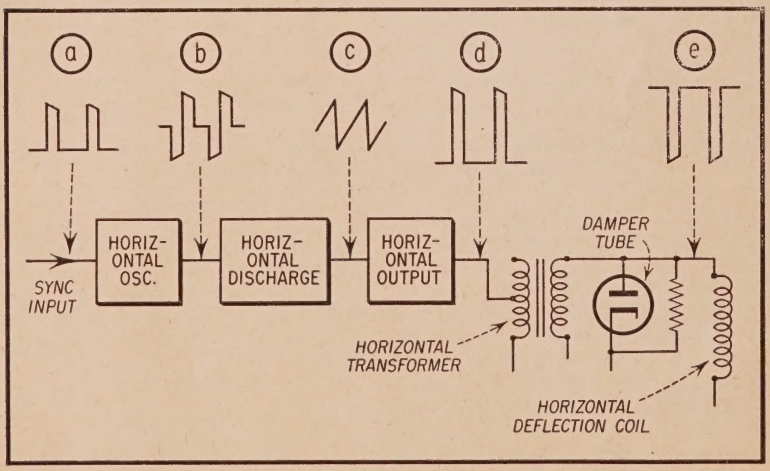

Fig. 3. Illustrative Horizontal Deflection System.

tween *horizontal* lines, instead of the verticals shown in Figure 4.

When deflection has been detected by picture distortion, and normal adjustment of the receiver operating controls brings little or no improvement of the situation, the next step will be to determine the origin and the causes. This involves inspection of the circuit at various points, working back from the deflection coils themselves through the horizontal and vertical sweep channels. The question often arises as to what line can be drawn between deflection trouble and sweep trouble. The answer is that the deflection coil action is so dependent upon the function of the sweep circuits that the two circuits hardly can be divorced completely but must always be considered together.

The oscilloscope is invaluable for checking the circuit performance. This instrument should have high-speed (wideband) response in its vertical amplifier. Flat response should be provided at least to 500 kc. While the TV horizontal and vertical sweep frequencies are relatively low the wideband scope response is necessary in order that the steep deflection waveforms may be reproduced faithfully. An oscilloscope voltage calibrator must be available, or the scope screen and gain controls must be accurately calibrated, in order that peak-to-peak values of the deflection voltages may be checked for comparison with the set manufacturer's data. The wave shapes also are compared with those given on the receiver circuit diagram.

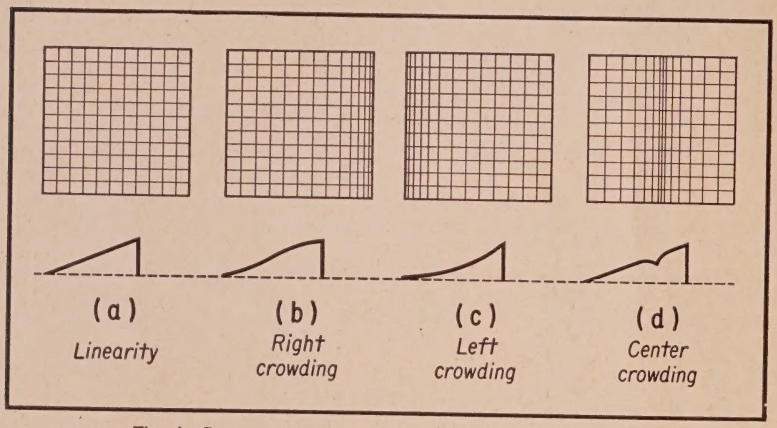

Fig. 4. Screen Distortion Due to Horizontal Non-Linearity.

Deflection Coils

After replacing any defective tubes in the subnormal deflection channel, the first troubleshooting test should be made on the deflection coils themselves. Initial inspection should eliminate any obvious defects such as open coil, burnouts, shorted turns, mechanical displacement, etc. Damping resistors or shunting capacitors should be disconnected temporarily and checked. Coil resistance measurements are of value only when the correct values are

available. Shorted turns may be evidenced by keystoning of the picture.

To check the deflection coil voltage, connect the vertical amplifier input of the scope across the deflection coil through a capacitive-type high-voltage probe, with the set tuned to a station. *The operator must be careful of high voltage when making this test, since the case of the instrument may be at high potential.* The internal sweep of the scope is set to 30 cycles when checking the vertical sweep, and to 7875 cycles for the horizontal sweep. Each of these adjustments will give two cycles of deflection or sweep voltage on the scope screen. The waveform will be similar to that shown at (d) in Figure 2, or (e) in Figure 3. Consult the manufacturer's service data for the exact shape of the voltage wave and also for its correct peak-to-peak value.

If the voltage waveform and amplitude are correct, proceed to check the deflection coil current waveform. This is done by temporarily opening one of the leads to the coil in question, inserting a 10 to 50 ohm non-inductive resistor in series with the lead and connecting the vertical input of the scope in parallel with this resistor. The scope is adjusted in the same manner as before. The voltage drop across the resistor will have the same waveform as the deflection coil current and will be proportional to it. The current wave thus observed should have good linear sawtooth shape.

If the deflection coil voltage does not have the correct waveform, further scope tests must be made to determine where the distortion originates. The following paragraphs describe a typical stage-by-stage procedure for making these tests, progressing back from the coils.

Vertical Channel

Refer to Figure 2 which is a block diagram of a possible vertical deflection system with sweep channel. The oscilloscope is grounded to the receiver chassis. Set the scope sweep to 30 cycles, SYNC to INTERNAL, and gain controls for a convenient pattern size. Provide a shielded probe for the vertical input of the scope. Tune the receiver to a station or test pattern and set its contrast, brightness, focus, linearity, height, and hold controls to their normal positions.

Since the deflection coil voltage already has been observed and found distorted, move the probe to the plate of the vertical output tube. Check the waveform ((c) in Figure 2) and compare its peak-to-peak amplitude with the service data.

If the waveform is also degraded at this point, transfer the probe to the vertical output grid or vertical oscillator output. Note that the wave here has undergone a 180° phase reversal. Compare its shape ((b) Figure 2) and peak-to-peak amplitude with service data.

When the probe is placed at the grid of the vertical oscillator ((a) Figure 2), a pair of vertical sync pulses should be observed. Compare their shape and peak-to-peak amplitude with service data.

If the observed signal is correct at any point and deformed at the next point, moving in the direction of the deflection coils, the intervening stage or subcircuit is defective and its components should be checked to determine the cause of the trouble. Adjustment or alignment should be performed where required.

Horizontal Channel

Figure 3 is a block diagram of a possible horizontal deflection system, including sweep channel. In individual receivers, there are variations of this basic arrangement which serves for illustration here.

For measurements in the horizontal channel, ground the scope to the receiver chassis and set its internal sweep to 7875 cycles, SYNC to INTERNAL, and gain controls for a convenient pattern size. A shielded probe must be used ahead of the scope vertical amplifier and a capacitive-type high-voltage probe must be employed at points between the horizontal output tube and horizontal deflection coils. *There is a shock hazard here, and the operator should use more than ordinary caution.* As before, the receiver should be tuned to a program or test pattern and its operating controls set to their normal positions.

Since waveform of the deflection coil voltage already has been found to be distorted, the first observations will be made with the probe first at the output and then the input of the horizontal transformer. The waveform ((d) Figure 3) and its peak-to-peak amplitude is compared with service data.

The next inspection point is the grid of the horizontal output tube; then, the grid of the horizontal discharge tube; and finally, the grid of the horizontal oscillator where two horizontal sync pulses will be observed. The corresponding waveforms ((c), (b), and (a) in Figure 3) and their peak-to-peak amplitudes at each point are compared with service data.

In one of the stages, the waveform, amplitude, or both will be correct at the input and distorted at the output. Components, d. c. voltages, and adjustments or alignments are checked to locate the cause of the trouble which originates within this stage.

Horizontal Pulling

Horizontal pulling, bending, or tearing of the picture often is noticed, and merits recognition in this discussion although a fine line of distinction might place it in the category of sweep defects rather than deflection trouble. In addition to subnormal performance of the horizontal sweep stages, this type of trouble can be traced to defective deflection coils, incomplete B-plus filtering, heater-cathode leakage in the signal circuits, reduced front-end sensitivity, and interfering magnetic fields cutting through the picture tube. Occasionally, this trouble is due to external interference and to noise or microphonics.

When pulling is present, the technician must determine whether it is present in the raster as well as in the picture. This can be established by viewing the "clear" raster. If the latter's vertical edges are bent or wavy, the distortion is on the raster itself and necessarily would also distort the picture.

Parasitics and Ringing

Damped wave oscillations, due to the inductance and distributed capacitance of the deflection coils, are excited by the deflection voltage pulses when there has been a failure of the damper diode or its circuit in the horizontal system, or damper resistors in the vertical system. These parasitic oscillations cause deflection non-linearity. Failure of the damper diode circuit also destroys or reduces power boost in modern sets employing this feature.

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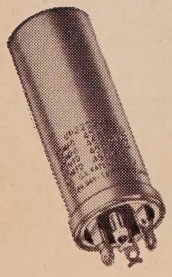

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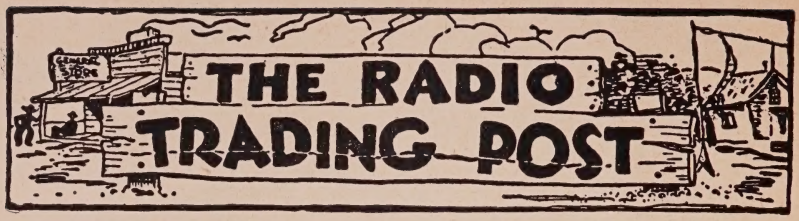

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FOR SALE — Dumont 274N, like new, $100; E-400 sweep, $100; Precision 912 tube, $35; EV-10, $37.50; 910 checker, $40; Simpson 260, $30; Hickok 288X, like new, $135. John N. Pellock, 227 W. Cook, Springfield, Ill.

FOR SALE — Complete Sprayberry home radio and television study course, 1250 pages, 78 lessons, and 250 pages on TV, plus Radio Service Bulletin. Cost $147.50, will sell for $22.50, parcel post prepaid. Send check or money order. H. D. Fry, 6200 Wayne Ave., Philadelphia, Pa.

FOR SALE — Hallicrafter S-40B, as new, wired for FM and phono input, wiring diagram and parts list, $72 FOB. C. Jaray, 36 Flower Lane, Roslyn Heights, N. Y.

SELL OR SWAP — 75 unused Thordarson portable stroblite H.V. Xformers, 4 v. vibrator primary, 1100 v. secondary for direct rectification or voltage doubling. One or all, $1.25 ea., postpaid, or swap for ?? Guy Slaughter, Crown Point, Ind.

FOR SALE — Unused GE transceiver BC-645A, $30, or will trade for what have you- J. A. Klingensmith, 5404 Audubon Rd., Bethesda 14, Md.

FOR SALE — BB FM phase modulator with own power supply, $20; 110 v. coax relay, $6.50; Gonset super-six converter, $42.50; Gonset noise clipper, $4.50; Hallicrafter pre-war Sky Buddy receiver in good cond., $20. George S. Maxey, Route 1, Box 3554, Redding, Calif.

FOR SALE — Like new RCP model 492, Volt-ohm-milliameter, 25,000 ohms per volt, $25; Heathkit 0-7 scope, $40, perf. cond. Paul Richter, 1446 Webster Ave., Bronx 56, N. Y.

SELL OR TRADE — Bradshaw model 10 VOM in perf. cond., $15, for good VTVM. B. Fogelman, 227 Riverdale Ave., Brooklyn 12, N. Y.

FOR SALE — RCP model 442 multitester, exc. cond., $10; RF sig. gen. model SG-43, from 260 Kc. to 90 Mc, $10 COD. Victor Kozma, 1665 Stadium Ave., New York 61, N. Y.

FOR SALE — Panadaptor PCA 2, T-200, exc. cond., $75; NRI Tele-Radio course, $20; TSC-12 Collins marine receiver with tubes, cable, mount, control head with spkr., $125. Want tape recorder. A. C. Livingstone, 1201 Ellis Ave., Fair Lawn, N. J.

WANTED — 30-50 Mc. FM rcvr., 110 v., in good working cond.; also 6 v. mobile receiver for above frequencies or 152-162 Mc., tuneable or Xtal if usable. Hughes, 1601 Mulberry St., Scranton 10, Pa.

WANTED — Several SX42 Hallicrafters radios, like new cond. only. Will pay up to $175, plus express. R42 speakers preferred. William H. Pendleton, 14 Brookdale Rd., Arlington 74, Mass.

FOR SALE — Hallicrafter S-38, like new cond., completely realigned, $25. Prefer local sale, demonstration gladly given. C. Kulwiec, 84 - 19 150 St., Jamaica 32, N. Y.

WANTED — Hi-Fi equip. Cash or will swap camera equip. Irving M. Taub, 44 Jones Rd., Revere 51, Mass.

FOR SALE — Model 795 Fada FM tuner in perf. cond., used about 50 hours, $18, plus R.R. express charges. Hill's Radio Service, 335 E. 6th St., Berwick, Pa.

TRADE — Hallicrafter S10 BC-1206 for ham Xtals, 3.5, 4, 6, 7, 8 Mc., Xtals. Cecil Van Buren, Star Route, Guymon, Okla.

WANTED — Tape recorder, Communicator II, Bandmaster VFO, Panadapter, Astatic D-104, Lysco ant. coupler, NC 183-D, NC-183TS speaker, NFM-83, SOJ-3. Harvey Blumsack, 20 Sheridan Ave., Medford, Mass.

SWAP — GE synchro type 5CT, also other types for good tape recorder or Hi-Fi equip. S. Consalvo, 2507 Southern Ave. SE, Washington 20, D. C.

WANTED — Sun or Westburgh electric tachometer with range of 4000 or 5000 RPM. Will trade GE wattmeter, good panel meters and elec. motors. Marion L. Rhodes, 30 W. Brown St., Knightstown, Ind.

FOR SALE — Sams Photofacts folders 1 and 2, 5 thru 9, 13 thru 27, 35 and 51 thru 80. Perf. cond., in loose leaf binders, $45. J. J. Maguire, 2012 Taylor St. NE, Washington 18, D. C.

WANTED — Late model scope and VTVM. Have for trade No. 530 Hickok tube tester, portable key machine, Simpson 280 set analyzer. Sam Berenblum, 417 Greenwich Ave., Greenwich, Conn.

FOR SALE — Used RCA 16GP4 CRT, unused 231T1 flyback, 211D2 yoke, 211R1 width coil, all $17; Eico 400C 5" scope, converted to high gain push pull, professionally wired, exc., $22. All FOB. Hal Magargle, 4812 Cooper La., Hyattsville, Md.

FOR SALE — Used Sams manual, Vol. 1, 1-10; Vol. 2, 11-20, Vol. 3, 21-30; Vol. 4, 31-40 in A-1 cond., $10 each. Soundcraft Products Co., 9 Kelley Square, Worchester 4, Mass.

FOR SALE — Sig. gen. AEI model A-200; tube tester, Jackson 427-A; Speco model stap. D. A. Creuzberger, 419 Bedford St., Hollidaysburg, Pa.

WANTED — VHF and UHF tubes; 15E, 829, 832 815 or others. State price or items wanted on swap basis. S. A. Campbell, 1073 Mohawk Rd., Schenectady 9, N. Y.

SELL OR TRADE — Supreme model 502 tube and set tester in good cond., $25, or what have you? Harry Williams, 816 W. High St., Petersburg, Va.

WANTED — Partially assembled or non-working Johnson Viking Xmitter kit, must be reasonable. D. Lackner, 2029 Bradley Place, Chicago 18, Ill.

FOR SALE — Model SS Unidyne (unidirectional) dynamic studio mike. Has lo, med, and hi imped. sw., includes stand. Lists at $67. Best offer. Edward Bowley, 31 - 19 43rd St., Long Island City 3, N. Y.

FOR SALE — Slightly used 4 antenna distribution amp. systems, cathode follower type; 8 channel outlets, perf. cond., model TVD-8, manufactured by Electro Engineering and Mfg. Co. What do you have to offer? Will ship. Jerome Gordon, 1056 Hamilton Ave., St. Louis 12, Mo.

SWAP — 2 unused 304 TH's, stamps, many first day covers, etc., for H.V. power supply or components, 4-125's, 813's or what have you? Prefer local. R. Peck, 2538 S. Robinson St., Philadelphia 42, Pa.

FOR SALE — 10" Motorola mah. consolette model 10VK5, good cond., $30. Jones Radio Co., 1115 Rambler Ave., Pottstown, Pa.

WANTED — HT-9 plate and osc. coils for 160 and 40 Mtrs.; used low priced bug; low priced VFO; 2 sets of Ballun coils. State price and cond. G. J. Goering, Jr., 2261 Andrews Ave., Box 68, New York, N. Y.

WANTED — Scope, tube tester, test equip., Hickok or RCP preferred. C. J. Schexnayder, 200 Shreveport Ave., Port Arthur, Tex.

SELL OR SWAP — Gonset Triband conv., master mount 8' stainless steel whip; APS-13 430 Mc., transceiver (converted and working). Want Pilot FM tuner, small radios, typewriter (portable) or cash. James Gysan, 146 Humphrey St., Marblehead, Mass.

SELL OR SWAP — Like new Hallicrafter receiver S40B for best offer or trade with cash for Hammarlund HQ129. Sidney Weissenberg, 1142 Ryland Ave., Cincinnati 37, Ohio.

FOR SALE — 3 stage PP 807 rig, 2 power supplies on same chassis, all stages tuned and metered, $75; Waterman S-10A Pocketscope, $25; Approved A-200 sig. gen., never used, $25. All postpaid. J. E. Howell, Box 126, Lumberton, N. C.

TRADE — Jeweler's lathe, complete with chucks, 3" Pilot TV in portable case, high-voltage components. Need tape recorder, 8 mm. camera and projector, typewriter, M. H. Aronson, 1155 King Ave., Pittsburgh, Pa.

SWAP — Radio books, parts and stamp collection for photo equip. or 8 mm movie films. James Hales, 13953 Charest, Detroit 12, Mich.

WANTED — Bell tape recorder, intercom system, 50 w. or larger amp., must be in good shape. State price and make. Charles Hoffman, 18 Case St., Mt. Morris, N. Y.

SWAP — B-flat Soprano Saxophone, exc. cond., for NC-57 National comm. rcvr., good cond.; or SW-54 rcvr. and electric Hawaiian guitar, NC-57 preferred. R. L. Faubion, Millboro, S. D.

FOR SALE — Model "P" battery eliminator, Daco model 501 tube tester not working, Navy VOM meter. Martin Strawn, 610 King St., Lancaster, Ohio.

WANTED — Either National or DeForest radio and television service manuals for cash. John I. Maloney, 2012 Nereid Ave., Bronx 66, N. Y.

WANT — RCA WV84A microammeter or good VTVM. Have Hartman cushion-top wardrobe trunk, good cond., 22" sq., 41" high. C. H. Tewksbury, 140 West Commerce St., Bridgeton, N. J.

SELL OR TRADE — Auto radio, books on radio and TV. Want Heathkit tube checker, prefer unassembled kit. Lowe E. Smith, Route 1, Silver Creek, Ga.

FOR SALE — 120 w. VFO 40 meter Xmtr., Converted BC-459A with commercially-built 525-250-250-12.6 v. reg. cabinet, power supply, tuning unit, complete set spare tubes, shielded cables, parts, diagrams. Roger Hoestenbach, 3116 N. Jackson Ave., Odessa, Tex.

SELL OR SWAP — Radio magazines and manuals, tube tester and condenser tester. J. S. Chinin, Box 11A, Beulah, Mich.

FOR SALE — Surplus BC-454-B 3-6 Mc. receiver, $15; SCR-522 2-meter receiver (converted) and transmitter, $25, all with diagrams and conversion data; Pilotuner FM tuner, $8. Martin Tenzer, 138 Dahill Rd., Brooklyn 18, N. Y.

SELL OR TRADE — Supreme radio diagram manuals 1 to 12, 1926-1938 to 1952; Arvin radio diagram manual; Supreme radio and electronic course; Supreme manual on pre-war record players, all $16.50. G. H. Swiska, 109 East School St., Woonsocket, R. I.

FOR SALE — Factory built and tested Feiler TS-3 Stethoscope with service guide, guaranteed, $28; 1 MA. galvanometer with ohms and volt scale, $5. L. Olson, 5225 W. 147th St., Box 132, Tinley Park, Ill.

SELL OR TRADE — R/C continuous tuner; Triumph No. 444 tube tester; Crosley Chattabox wireless intercoms. Harold B. Gruen, 24 No. Newport Ave., Ventnor, N. J.

FOR SALE — Standard deluxe 16 mm. projector with case, f1.6 lens 2", lamp 750 w., 400 ft. capacity, AC-DC, $49.50. Also radio service books and magazines, and parts, best offer. M. Berlot, 92 Second Ave., New York 3, N. Y.

WANTED — 5" scope, in good cond. and reasonably priced. H. K. Brown, Box 88, Wheaton, Ill.

TRADE OR SELL — RCP 802 tube and set tester, with modernization kit, $17.50; RCP 442 VOM in good cond., $10; Sprayberry radio course. Carl J. Machuta, 1919 Maryland, Flint 6, Mich.

FOR SALE — Parts and tubes for RCA projection television set. H. Bergh, 1583 E. 96th St., Brooklyn 36, N. Y.

FOR SALE — Like new National NC-57 comm. receiver. E. Schmitka, 1481 Shakespeare Ave., Bronx 52, N. Y.

FOR SALE — Sylvania 5" scope, $90; Precision 920P tube checker, $30; Riders TV 1, 2 and 3, $15 each; Oak Ridge synchro-sweep gen.; Millen Exciter, and 6 meter 6J6-832 R.F. Want RME DB-20. Hopper's Radio Shop, 301 Hollis St., Framingham, Mass.

SELL OR TRADE — Complete Sprayberry radio and TV course with parts for 6-tube receiver and extra parts, $35 or trade for .22 automatic rifle in good cond. Harold Dorsey, 325 Fulton St., Mankato, Minn.

WANTED — Simpson 260 and Triplett 666H VOM, Grid Dip oscillator. Will trade: '41 - '47 Buick radios, 350 v. Vibrapack, novice Xmitter, converter: 6-110 v. AC, 40 w. modulator, 600 v. 150 MA supply. Stanley, 2748 Meade St., Detroit 12, Mich.

FOR SALE — Elapsed time meter, $7; Weston Ohmmeter 0-10 and 0-1000, with case, $13; Willard 2 v. 20 AH batteries, $2 each. Eric Scholer, 209 Glengary Rd., Schenectady 4, N. Y.

SELL OR TRADE — Direct Positive ($2\frac{1}{2}$ x $2\frac{1}{2}$) camera f3.5 Ilex Seminat lens for 14" or larger TV set or $100. Bill Cox, Box 417, Caraway, Ark.

WANTED — SW-3 receiver. Cash, or exc. swap in radio gear. Joseph Nester, RD 1, Emporium, Pa.

SELL — Triplett 3413 tube tester; Admiral 16" TV table model; NC-125 comm. receiver with speaker. All in exc. cond. C. Horn, 325 E. 163rd St., New York 51, N. Y.

FOR SALE — BC-348L 110 v. built-in S. meter, good cond., $75; Millen 90811 R.F. amp. and two 829B tubes, like new, $30; BD-77-C dynamotor in primary 12 v., out 1000 v. .35 A, $15. Bob Kimmel, Route 2, N. Manchester, Ind.

FOR SALE — ATR Type 220 rectifier power supply, 6.3 v. at 14 amperes, 14 v. at 7 amperes, $20; Supreme 89 deluxe tube and set tester, $15; Supreme 581 oscillator,, $20. W. E. Menehan, 7416 5th Ave., North Bergen, N. J.

WANTED — Compact, light-weight transmitter, built-in power supply, 20 and 40 meter bands, CW or CW/phone, EC-1 or EC-4 receiver. Will trade Mon-key and Zeiss Ikon camera, Super Ikomat, 2.8, 1/400th, Tessar. H. Humpton, 360 California, Memphis 5, Tenn.

FOR SALE — Heath condenser checker, model C-2, like new, complete with leads and instructions. R. A. Staib, 1621 N. Avers Ave., Chicago 47, Ill.

FOR SALE — Model 145 Eico sig. tracer, $12; 40 Photofact folders 4 to 217, $25. Need typewriter. Howard Adams, 3682 Fairoaks, Memphis, Tenn.

FOR SALE — Ham transmitter Millen 90810, modulator, and power supply, 1500 v., 300 mils, Dipole antenna for 10 meters, plus Xtals, $99.45; Solar Capacitor Analyzer, $25; Freed-Eisenman AM-FM receiver, $49.49. Jim Adams, 10 Rutland Rd., Massapequa, L. I., N. Y.

FOR SALE — Sams sets 1 to 100. Vols. 1 to 10 in binders, exc. cond., $100 plus express COD. O. H. Staggs, 869 Sherman St., Logansport, Ind.

FOR SALE — Eico VTVM, thoroughly tested and expertly wired, $25, COD. John Rohman, 1820 Greene Ave., Brooklyn 37, N. Y.

FOR SALE — Riders manuals, 10 and 12 with supplements, include index book, 1 to 24, never used; Triumph 130 sig. gen., good cond. Best offer. Radio Service, Box 73, Versailles, Mo.

FOR SALE — Pentron wire-recorder-radio phono combination, portable, best offer over $75; Astatic DN-HZ mike on grip-to-talk stand, $20. Ray Fisher, 418 Walker, Shelbyville, Ind.

FOR SALE — National HFS, $100; Bell duo-speed portable disc recorder, $35; BC-455, $4; 152 Mc. receiver, 6 v., $10; printed cascode tuner and tubes, $10. P. Zukauckas, 4862 Mass. St., Gary, Ind.

SELL OR TRADE — Heath sig. tracer, 150 w. Xmtr. (VFX680 Xciter, PR 811's final complete with 1000 v. power supply), GE self-charging 5-band portable receiver. Want portable typewriter or mill, electric drill, bench saw, or TV sweep gen. John M. Miller, 3225 N. 6th St., Harrisburg, Pa.

WANTED — Tuner strips for 1948 Philco TV receiver for channel six (6); Philco parts: 32-4115-6; 32-4222-6; pix tube for Philco projector, model 48-2500. Tim F. Sheehan, 496 W. Park Place, Troy, N. Y.

WANTED — Construction details and plans for "Klipschorn." R. V. Roickle, 74 Albemarle Ave., Hempstead, N. Y.

FOR SALE — Eico VTVM, $25; RCP sig. gen., $25; 1/4 HP AC motor, $6; 1/3 HP AC motor, $8; 1947 Motorola auto radio, $18. Harold Levinson, 6117 - 81st St., Elmhurst, L. I., N. Y.

WANTED — RCA 10 lessons TV home study course, books on TV servicing and test equip. Advise cond. and price. H. C. Williams, 816 W. High St., Petersburg, Va.

FOR SALE — Latest model 6 w. Heathkit amp., best offer over $20; like new 1-tube GE phono pre-amp. 110 v. AC, best offer over $9. Stanley Strangle, Box 6, Trout Creek, Mich.

SELL OR TRADE — Echophone ECI-B ham radio receiver; Hallicrafters S-86 civil defense radio receiver; Simpson 315 sig. gen.; RCA Victor 153 sig. gen., Webster wire recorder 80. All in good cond. D. L. Smith, Box 191, Leaksville, N. C.

WANTED — Rek-O-Kut variable speed record player, in good working cond., either model P-43VM or P-43VC. R. B. Easton, Box 37, Aberdeen, S. Dak.

FOR SALE — Triplett tube tester, revised and in good cond., just installed new roll chart, $20 FOB. Roy O. DeVoe, Box 414, Spring Green, Wis.

FOR SALE — 8 1/2 x 11 portable photostat machine, with dryer; printing press, treadle type, old Kelsey model, 9 x 13 size. Trade either for tape recorder. Tom De Palma, Fancher, N. Y.

SELL OR TRADE — All band 900 w. PP813 transmitter with VFX-680, 3 power supplies, all circuits metered, inside enclosed 83" rack, variac input, CX-40A condenser and MBL-40 tuner. Frank Guetter, 11828 S. Sangamon St., Chicago 43, Ill.

FOR SALE — Sams Photofacts up to and including No. 222, covers radios, record players ,auto radios, no TV, 25c per folder, must sell all. R. R. Foster, 3359 N. Illinois St., Indianapolis 8, Ind.

FOR SALE — Electro-voice No. 3000 TV booster, $20; 2-stage Anchor ARC101-100 TV booster, $15. Mark Ewald, 417 E. State St., Rockford, Ill.

WANTED — Gasoline engine driven gen. set, 120 v., 60 cy., 1.5 KVA or what rating have you? C. H. Crawford, 216 Russell Ave., Liverpool, N. Y.

FOR SALE — 500 w. dual channel audio amp (4-838's), complete with drivers and power supply, all in 6' rack cabinet. Suitable for skating rink, amateur modulator, etc., $75; Jensen 14" M-10 auditorium speakers, 3" VC, $5 each. Robert Eilenberger, 510 Harrison St., S. Plainfield, N. J.

TRADE — Philco VTVM circuit master, Eico sweep gen., Eico VTVM 214K, for tape recorder, power tools, or what have you? E. DeCobert, 609 Henrietta St., Gillespie, Ill.

WANTED — TV and radio books, courses, service manuals, etc. National Radio and TV Service, 511 Pleasanton Rd., San Antonio 4, Tex.

WANTED — Technical manuals for SCR-543 and SCR-284 radio sets. Will pay cash. Norman Wehrli, Box 1247, Kilgore, Tex.

FOR SALE — Electro-Voice mikes, models: V-1, $23; 950, $20; 605, $10. R. L. Hutchison, 2940 S. Gaylord St., Denver 10, Colo.

SELL OR TRADE — Radio, TV, and Ballast tubes; Zenith remote control motor assembly, $6. Have good 7" and 8" TV tubes. Make offer. J. Andrews, 740 Maple St., Bethlehem, Pa.

TRADE — Console model S.W. diathermy machine with new 805 tubes, less pads, for press camera outfit or 16 mm. motion picture projector with sound or other photographic equip. in the 16 mm. or still field. Willis G. Jenkins, 408 S. Woodhams St., Plainwell, Mich.

POSITION WANTED — Young man, 21, single, with references, wants employment with Hi-Fi sales, or radio-TV servicing organization, experienced, will travel. More information on request. Don Schatz, c-o M. S. Stage, Baker, Ore.

WANTED — All-directional reflector — prism type — which reflects light back precisely in the direction from which it arrived. Will pay double list price. George Landry, Box 63, Somerville 44, Boston, Mass.

WANTED — 10, 20, 40, and 80 meter bandspread coils for HRO-5 or M. Swap equivalent general coverage coils plus consideration, or cash. Charles A. Liddicoat, 1346 Sycamore Ave., Wilmington 5, Del.

WANTED — Complete course in electric motor repair. State copyright date. Michael Hoblak, Jr., RD 1, Noxen, Pa.

WANTED — Sams Photofacts for cash or trade exc. Eico 6-12 v. eliminator, eleven 1000 ft. rolls 300 ohm wire. C. T. Trinka, 815 Central Ave., Hamilton, Ohio.

FOR SALE — H. H. Scott model 110A noise suppressor with tubes, perf. cond., $16. James Littig, Box 203 Kasota, Minn.

FOR SALE — Hallicrafters S-38 in exc. cond., $20, shipped prepaid. FM tuner wanted. H. Adriance, Route 9W, Milton, N. Y.

WANTED — SX-42 in good cond., reasonable, for cash. Will pick up in metropolitan area. Ed. J. Morgan, 623 Cherry St., Norristown, Pa.

WANTED — P.F. indexes up to No. 26, and 30, 31, 33, 34. Will pay 25 cents each, plus postage. Arjay Radio Service, 1929 S. Spring St., Springfield, Ill.

WANTED — Used Philco chassis, model 49-1405, less tubes, regardless of cond. Rupert J. Thomas, 817 W. Ashley St., Jacksonville, Fla.

SELL OR TRADE — Riders radio manuals, 1-5 abridged, 6 to 17 incl. All like new, best offer . George Kuhn, 6 W. 19th St., Weehawken, N. J.

FOR SALE — Triplett portable VOM and RF gen. combination, good cond., complete with leads, batteries, operating manual, $25 FOB, or trade for what have you? Nick Sydoryk, 4211 N. Newland, Chicago 34, Ill.

SELL OR SWAP — Complete QST's, 1927-1952; 75 copies CQ; Hallicrafter S-20R; tubes and other parts. Want autos, lamps, horns, license plates before year 1915 or information leading to them. Bob Schill, 1400 Poulson St., Wantagh, N. Y.

TRADE — Heath TS-2 sweep gen. for scope, any model, or other Heath instruments or Rider or Hickok Chanalyst. Will pay difference. C. F. Albertoni, 2629 Paxton Ave., Akron 12, Ohio.

FOR SALE — Pickering 132-E record compensator, can be used with GE magnetic pickups, $5. J. E. Eichenberg, 2271 Hayes St., San Francisco 17, Calif.

WANTED — Small 24-28 v. DC power supply suitable for operating surplus equip. Herman's Radio Service, 803 W. Locust St., Bloomington, Ill.

SELL OR TRADE — 3 transmitting tubes 311CH (United Electronics); GE self-charge portable radio No. 250 in A-1 cond. All for $85. Need scope and tube tester, good cond. Manuel Perez, 119 Ninth Ave., New York 11, N. Y.

WANTED — Used RCA 400, Sr. 16 mm. sound movie projector with or without speaker, in good cond. Write cond., price, etc. FOB Jackson, Miss. L. A. Roberts, Jr., 251 Sunny Lane Drive, Jackson, Miss.

TRADE — List of used technical books and correspondence courses, sent free on request. Your list is solicited. C. R. Leutz, Box 368, Silver Spring, Md.

SWAP — Dumont 3" oscillograph for old or new guns, test equip., good small TV set, or key machine. W. H. Norman, 112 Douglas Ave., Rockwood, Tenn.

WANTED — Riders manuals Vols. 9 to 14 incl., State best price first letter. Boswell Radio and TV Service, Greencastle, Ind.

WANTED — Glass dial scale for Truetone, model D-1143. Urgently needed, pay top price. Warren's Radio and TV, 94 Milton Ave., Dorchester 24, Mass.

SELL OR TRADE — GE 250 self-charging portable; RCA 171 station allocator; Eastman 16 mm. projector; Zenith 3-way portable; sig. tracer; amp.; TV antenna rotator; camera; pair Walkie-Talkies. E. G. Bartlett, Box 136, Atlanta, Mo.

WANTED — Tube testers, sig. gen., 3" scope, PA system, or ?? Give full details. G. C. Hologa, Winchester, Wis.

WANT — Eico 322-K sig. gen. in trade for radio parts, coils, transformers, chokes, condensers, sockets, etc. Vernon Kroh, New Salem, N. Dak.

FOR SALE — K & E Log-Log Duplex Vector slide rule, with case, exc. cond., $12.50. J. Kozlowski, 327 Montgomery St., Jersey City, N. J.

FOR SALE — Philco sig. AM gen., $10, plus postage; Heath AM sig. gen., $15, plus postage. Agostino, 223 So. Winebiddle Ave., Pittsburgh 24, Pa.

FOR SALE — Late model Zenith table model radio, $20; Air King console, 12½" TV set in good working order, $60; Bell & Howell 500 w. 16 mm. movie projector, $45. Calderaro, 32 Elm St., Wakefield, Mass.

WANTED — Synchros or Selsyns 60 cycle types: $25 for 1HG, 1HCT, 1DG, 1D, 1F, 1G, 1DF, 1CT, 5DG subject to inspection; 5CT, Size 6 and 7, 2J5FB1, Diehl control motors 49-17, 25-11, etc., other types will advise. Electro, 58 Eastern Ave., Boston 13, Mass.

FOR SALE — Radio Craftsman TV chassis tuning eye, 19" round tube, mask and mounting kit, $149; Tapemaster tape recorder and preamp., $79. T. Fortman, 9010 N. Laramie Ave., Skokie, Ill.

WILL SWAP — Printing service at the rate of: billheads $8.50 per 1,000, calling cards $6.50 per 1,000, for tools and test equip. W. J. Porter, 198 Durham St., Mt. Airy, N. C.

SELL OR SWAP — Latest Jackson TV sweep gen. and marker TVG-2, Riders manuals, 6, 8-13; Philco or RCA 10" TV. Want Revere "90" projector, Dumont R105 console cabinet for 19". S. W. Kovacs, 417 Vannest Ave., Trenton 8, N. J.

FOR SALE — Hallicrafter S-51 Marine radio rcvr.; Zenith transoceanic portable, both in original boxes, $75 each. L. Lloyd Rondeau, 2436 Carney Ave., Marinette, Wis.

FOR SALE — Philco 38-690 Super Hi-Fi American and foreign rcvr., automatic and magnetic tuning, superheterodyne, 550 Kc. to 18.2 Mc. in 5 bands. Employs 20 tubes, 3 spkrs., 4 acoustic clarifiers, 15 w. undistorted output, $100. Edward L. Jayson, 415½ Evergreen Ave., Bradley Beach, N. J.

FOR SALE — Back issues of QST, 15 cents each, Electrical Engineering $1.20 year's copies, Rola Series F-5 electrodynamic twin 6" speakers $1. All plus postage. R. Lebowitz, 388 Avenue S, Brooklyn 23, N. Y.

FOR SALE — 0-10,000 ohm resistance spotter for measuring unknown resistances, $10; 0-100 amperemeter, $10; 0-60 wattmeter, $5, all portable. 3 Vols. Silvertone manuals, $10; Zenith manuals, Vols. 1 and 2, $5. Send for list of other manuals. Albert Hart, 207 N. Raymond St., Griffith, Ind.

WANTED — Reliable and experienced radio repairman, capable of assuming management of an established and successful service business and recording studio. Marfa Radio and Electronics, Box 187, Marfa, Texas.

WANTED — Good final amp. (144 Mc.) with modulator and power supply all on one chassis to use with Gonset communicator, as exciter, etc., or can anyone build up a final using AX-9903, a pair of 6V6's and a 83 rect. tube? Joseph Zukauskas, 2227 Germantown Ave., Philadelphia 33, Pa.

WANTED — Viking II Xtr., must be factory built. Cash for good buy. Jess B. Tatum, Kershaw, S. C.

FOR SALE — BC 348-0 receiver converted to 110 v. AC, less 200-500 Kc., band coils, $50, express collect. W. B. Taylor, 9501 Stratford Drive, Oklahoma City 14, Okla.

WANT — NC 100-ASD or SX24 in good cond. Pay cash or trade test equip. T. Ferguson, 171 East 91st St., New York, N. Y.

FOR SALE — Sams Photofact folders 1 thru 10 deluxe hard cover binder, good cond., over 400 sets. Vol. 1 separate section on changers, $5 COD. Samuel T. Chase, 19 Kafka Drive, Dunellen, N. J.

FOR SALE — Eico sig. gen. 315 and Eico VTVM, model 221. V. Vigliano, 70 - 80 Kenmare St., Apt. 1, New York 12, N. Y.

SELL OR TRADE — 8 mm. metal and plastic reels, 7" dia. suitable for tape recorders and movie projectors. What have you? Walter Bartell, 1107 North Western Ave., Chicago 22, Ill.

FOR SALE — Tube checker ,exc. cond., Electronic Measurement model 200 Make offer. Sam Wiseman, 114 Elmwood Ave., Buffalo 1, N. Y.

FOR SALE — Best cash offer, unused HQ 129X, metropolitan area only. Bill Green, 38 Gautier Ave., Jersey City, N. J.

WANTED — June and March, Vol. 23, numbers 1 and 2, 1946, issues of "Electrical Communications" IT & T Tech. Journal. Donald Ringler, 100 Irvington St. SW, Washington 24, D. C.

WANTED — Skyrider Marine or S-22R, also want aircraft equip. Bill Romain, 28 Avon Place, Staten Island, N. Y.

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- ★ Seal-Vented

Maintaining the reputation for the most complete replacement line, C-D now has available the new 6300 series of vibrators to take care of the 12-volt circuits on many of the new 1953 cars. Once again, this proves that all you need in vibrators for full coverage* in the replacement market is C-D . . . longer life, dependable and trouble-free performance. And ***seal-vented*** . . . . even greater than ever!

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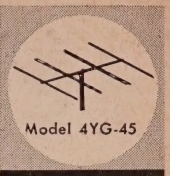
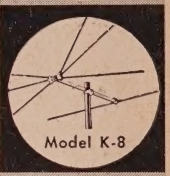
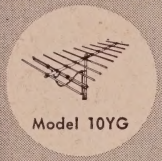
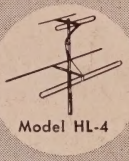
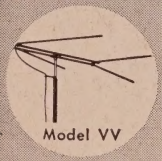

Model 4YG-45

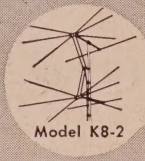

Model K-8


Model 10YG


Model HL-4

Model 93-FM


Model VV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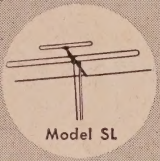
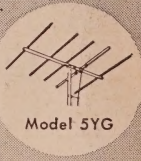

Model SL

Model 92-FM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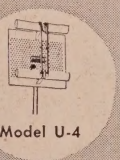
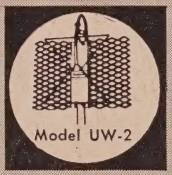

Model U-4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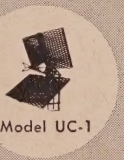
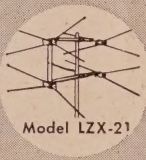
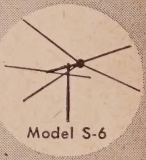
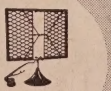

Model UC-1

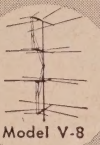

Model LZX-21


Model S-6

Model UBT-1


Model UW-1-2

Model UW-4


Model V-8

Model VU-1

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